SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ON

COURSE OUTLINE

COURSE TITLE: Calculus

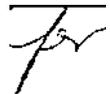**CODE NO:** MTH 551-4   **SEMESTER:** Three

PROGRAM: Mechanicai/Electhcal/Electronics/Gomputer

AUTHOR: John McGauiey

DATE: June 1997   **PREVIOUS OUTLINE DATED:** June 1996

APPROVED: _____ **DEAN**

TOTAL CREDITS:

PREREQUISITES: MTH 143

LENGTH OF COURSE;   **TOTAL CREDIT HOURS: 64**

I.   COURSE DESCRIPTION:

The basic concepts of calculus are introduced through an emphasis on applications and examples. Topics include limits, simple derivatives, derivatives of trigonometric and logarithmic functions, applications of derivatives, curve sketching, integration, and applications of integration.

II. STUDENT PERFORMANCE OBJECTIVES:

The basic objectives are that the student develop an understanding of the methods studied, demonstrate a knowledge of the facts presented and show an ability to use these in the solution of problems. To accomplish these objectives, exercises are assigned. Test questions will be of near equal difficulty to questions assigned in the exercises. The level of competency demanded is the level required to obtain an overall passing average on the tests. The material to be covered is listed below.

Topic 1:
1.   Evaluate limits of algebraic functions.
2.   Approximate the slope of a tangent to a curve.
3.   Find the derivative of an algebraic function using the delta method.
4.   Find instantaneous rates of change of a function using derivatives.
5.   Find the derivative of a polynomial using a rule.
6.   Find derivatives of other algebraic functions (products and quotients) using rules for differentiation.
7.   Find the derivative of a power of a function - Chain rule.
8.   Find the derivative of an Implicit function.
9.   Find higher derivatives of algebraic functions.

Topic 2:
1.   Find slopes and equations of tangent and nomnal lines.
2.   Compute velocities and accelerations for curvilinear motion.
3.   Solve related rate problems.
4.   Make graphs of non-linear functions using derivatives.
5.   Make graphs of discontinuous functions using derivatives, asymptotes, intercepts.
6.   Solve applied maximum-minimum problems.

iI. STUDENT PERFORMANCE OBJECTIVES (Continued):

Topic 3:
1. Use differentials to compute small change in a function.
2. Find an antiderivative using derivative ailes.
3. Use the basic rule for integration of algebraic functions.
4. Determine approximate areas under curves from graphs.
5. Determine exact areas under curves by integration - the fundamental theorem of integral calculus.
6. Evaluate other algebraic definite integrals.

Topic 4:
1. Solve problems involving distance-velocity-acceleration, current-voltage-charge using integration.
2. Find areas (between two curves) using horizontal and vertical elements and definite integrals.
3. Find the volume of a solid of revolution using the disk or shell method.

Topic 5:
1. Find derivatives of expressions containing sine or cosine functions.
2. Find derivatives of other trigonometric functions.
3. Find derivatives of inverse trigonometric functions.
4. Solve worded problems which involve trigonometric functions.
5. Find derivatives of logarithmic functions - and constant base.
6. Find derivatives of exponential functions - any constant base.
7. Solve worded problems involving logarithmic of exponential functions.

III. TOPICS TO BE COVERED: **Approximate Time Frame**

1. The Derivative   15 periods

2. Applications of the Derivative   15 periods

3. Integration   10 periods

4. Applications of Integration   10 periods

5. Differentiation of Transcendental   14 periods
   Functions

IV. LEARNING ACTIVITIES;

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
1.0	THE DERIVATIVE	Chapter 23
1.1	Limits	Questions: 1-44 Page 617
1.2	The slope of a tangent to a curve	Questions: 1-24 Page 621
1.3	The derivative	Questions: 1-32 Page 625
1.4	Derivatives of polynomials	Questions: 1-32 Page 634
1.5	Derivatives of products and quotients of functions	Questions: 1-32 Page 638
1.6	The derivative of a power of a function	Questions: 1-38 Page 644
1.7	Differentiation of implicit functions	Questions: 1-32 Page 648
1.8	Higher derivatives	Questions: 1-34 Page 651
2.0	APPLICATiONS OF THE DERIVATIVE	Chapter 24
2.1	Tangents and normals	Questions: 1-24 Page 659
2.2	Curvilinear motion	Questions: 1-24 Page 667
2.3	Related rates	Questions: 1-24 Page 670
2.4	Using derivatives in curve sketching	Questions: 1-28 Page 677
2.5	Applied maximum and minimum problems	Questions: 1-30 Page 686
3.0	INTEGRATION	Questions: 1-20 Page 695
3.1	Differentials	Chapter 25
3.2	Antiderivatives	Questions: 1-32 Page 698
3.3	The indefinite integral	Questions: 1-44 Page 703
3.4	The area under a curve	Questions: 1-20 Page 708
3.5	The definite integral	Questions: 1-36 Page 711

IV. LEARNING ACTIVITIES (Continued):

TOPIC NUMBER	TOPIC DESCRIPTION	REFERENCE CHAPTER ASSIGNMENTS
4.0	APPLICATION OF INTEGRATION	Chapter 26
4.1	Applications of the indefinite integral	Questions: 1-20 Page 727
4.2	Areas by integration	Questions: 1-28 Page 733
4.3	Volumes by integration	Questions: 1-32 Page 738
5.0	DIFFERENTIATION OF TRANSCENDENTAL FUNCTIONS	Chapter 27
5.1	Derivatives of sine and cosine functions	Questions: 1-50 Page 764
5.2	Derivatives of other trigonometric functions	Questions: 1-4§ Page768
5.3	Derivatives of inverse trigonometric functions	Questions: 1-48 Page 772
5.4	Applications	Questions: 1-8, 11-16 Page 776
5.5	Derivatives of logarithmic functions	Questions: 1-48 Page 781
5.6	Derivatives of exponential functions	Questions: 1-52 Page 784
5.7	Applications	Questions: 1-32 Page 788

V.   REQUIRED RESOURCES / TEXTS / MATERIALS:

1.   Text; Washington, "Basic Technical Mathematics With Calculus", Sixth Edition, Metric Version. Benjamin/Cummings Pub. Co 1995.

2.   Calculator: (Recommended) SHARP Scientific Calculator EL-531G. The use of some kinds of calculators may be restricted during tests.

VI. EVALUATION PROCESS/GRADING SYSTEM:

MAJOR ASSIGNMENTS AND TESTS
While regular tests will normally be scheduled and announced beforehand, there may be an unannounced test on cuaent work at any time. Such tests, at the discretion of the instructor, may be used for up to 30% of the overall mark.

At the discretion of the instructor, there may be a mid-term exam and there may be a final exam, each of which can contribute up to 30% of the overall mark.

The instructor will provide you with a list of test dates. Tests may be scheduled out of regular class time.

ATTENDANCE
It is your responsibility to attend all classes during the semester. Research indicates there is a high correlation between attendance and student success.

If you are absent from class, it is your responsibility to find out from your instructor what work was covered and assigned and to complete this work before the next class. Your absence indicates your acceptance of this responsibility.

Unexcused absence from a **test may result in** a **mark of zero ("0").** Absence may be excused on compassionate grounds such as verified illness or bereavement. On return from an excused absence, you should ask your instructor to schedule the writing of a make-up test. Failure to do so will be considered as an unexcused absence.

METHOD OF ASSESSMENT (GRADING METHOD)

A+	Consistently outstanding	(90% -100%)
A	Outstanding Achievement	(80% - 89%)
B	Consistently above average achievement	(70% - 79%)
C	Satisfactory or acceptable achievement in all areas subject to assessment	(55% - 69%)
X or R	A temporary grade, limited to situations with extenuating circumstances, giving a student additional time to complete course requirements **(See below)**	(45% - 54%)
R	Repeat - The student has not achieved the objectives of the course, and the course must be repeated	(0% - 44%)
CR	Credit exemption	

VI.   EVALUATION PROCESS/GRADING SYSTEM (Continued):

The method of calculating your weighted average will be defined by your instnjctor. Since grades are based upon averages, it follows that good marks in some tests can compensate for a failing mark in another test.

Make-Up Test (if applicable)
An "X" grade may be assigned at the end of the regular semester if you have met _ALL_ of the following criteria:

- an overall average between 45% and 54% was achieved
- at least 50% of the tests were passed
- at least 80% of the scheduled classes were attended
- all of the topic tests were written

If you are assigned an "X" grade, you may convert it to a "C grade by writing a make-up test on topics agreed to by the instructor. This test will be available at the time agreed to by your instnjctor.

At the end of the regular term, it is your responsibility to obtain your results from your instructor and, in the event of an "X" grade, to inquire when the make-up test will be available.

The score you receive on this make-up test will replace your original test score and be used to re-calculate your weighted average. If the re-calculated average is 55% or greater, a "C" grade will be assigned. If the re-calculated average is 54% or less, an "R" grade will be assigned.

"R" and "X" Grades at the end of the Semester
If an "X" grade is not cleared by the specified date, it will become an "R" grade. Except for extenuating circumstances, an "X" grade in Math will not be carried into the next semester.

"R" Grades during the Semester
A student with a failing grade and poor attendance (less than 80% attendance) may be given an "R" at any time during the semester.

VII. SPECIAL NOTES:

Students with special needs (e.g. physical limitations, visual impairments, hearing impairments, teaming disabilities), are encouraged to discuss required accommodations with the professor and/or contact the Special Needs Office.

Advanced Standing
Students who have completed an equivalent post-secondary course must bring relevant documents to the Coordinator, Mathematics Department:
*   a copy of course outline
*   a copy of the transcript verifying successful completion of the equivalent course

Note: A copy of the transcript must be on file In the Registrar's Office.

VIII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the instructor or the Prior Learning Assessment Office (E2203).